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(56) Documents cited
GB 2042458 A GB 0894330 A GB 0827324 A
US 4764074 A US 4701092 A US 4271755 A
US 4073387 A

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INT CL[5] B65G

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(54) Apparatus for handling bags of granular material

(57) Apparatus for handling bags of granular material comprises a pallet magazine 2 for a stack of empty pallets 21 which are fed by a pallet transfer means to a waiting station 10 and from there to a palletiser 12 to which bags 15 of granular fertilizer material are delivered for palletising. Empty pallets 21 are loaded into the pallet magazine 2 by a grab mechanism 6 comprising a pair of grab arms (30, Fig. 2). To transfer a pallet from the pallet magazine 2 to the waiting station 10, ram-driven risers 50 are first extended to raise the bank of pallets. A ram-driven clamp 52 is extended to engage the pallet above the lowermost pallet 21 and clamp it in a raised position. The risers 50 are then retracted allowing the lowermost pallet 21 to fall onto a conveyor (55, Fig. 8b), which delivers the pallet 21 to the waiting station 10. The palletised bags are finally shrinkwrapped. The grab mechanism picks up empty pallets from a robot trolley 4. The provision of the waiting station, which can be pallet-fed by hand, avoids shut down in the event of difficulties with the pallet magazine.

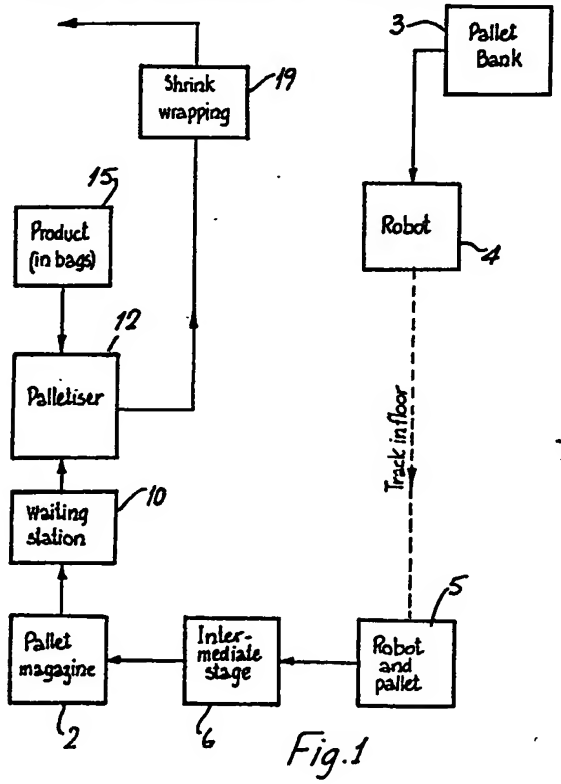

Fig.1

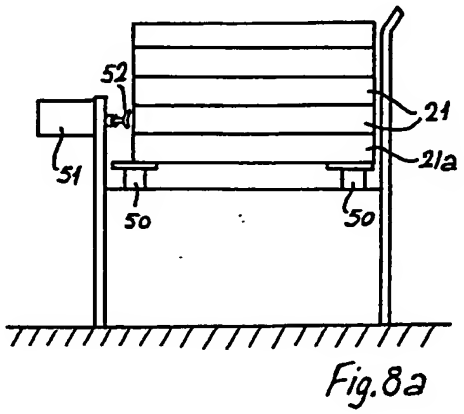

Fig.8a

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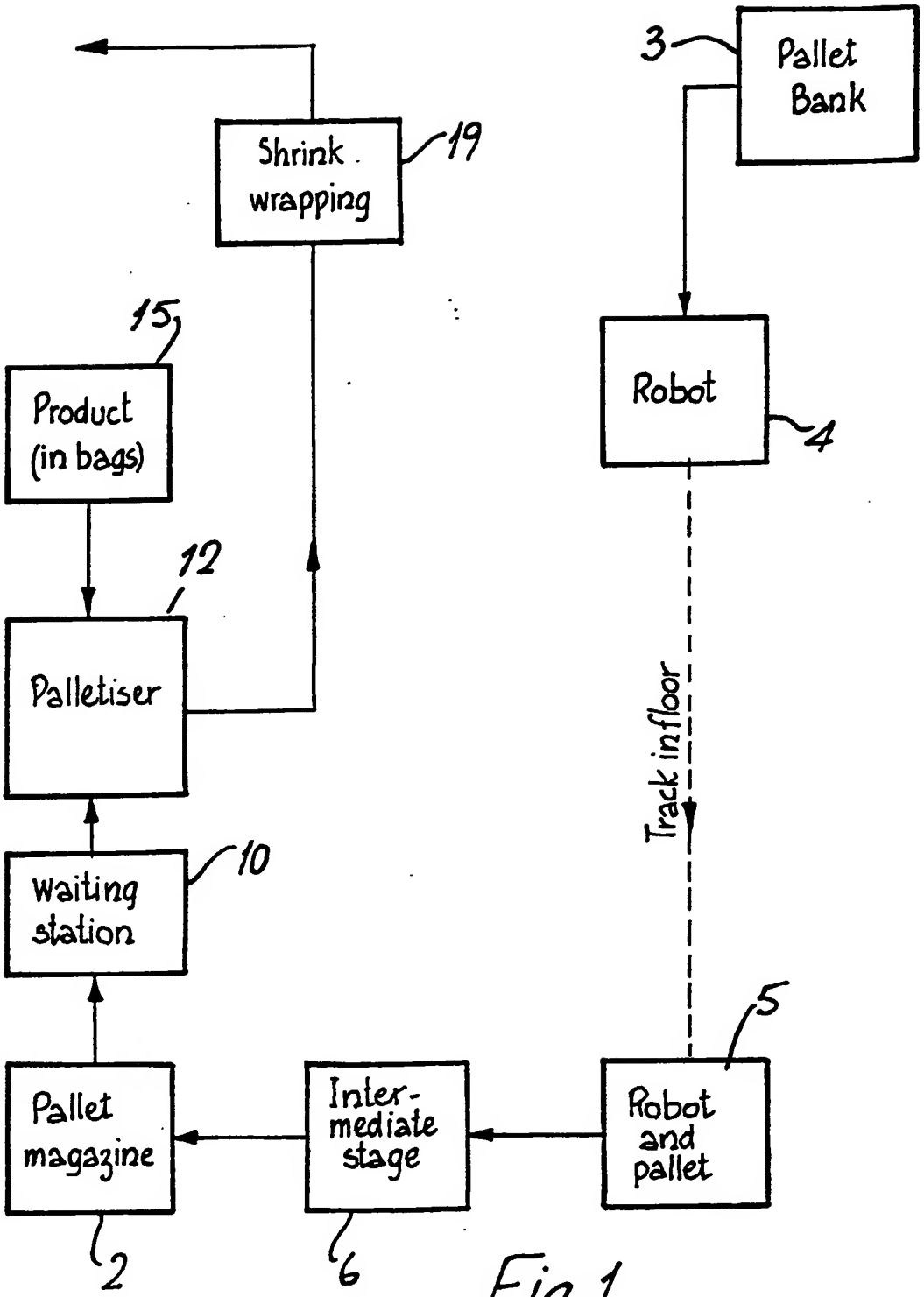
3
Pallet Bank
Shrink wrapping
19
15
Product (in bags)
Robot
4
12
1
Palletiser
Track in floor
10
Waiting station
5
Pallet magazine
Inter-mediate stage
Robot and pallet
2
6

Fig.1

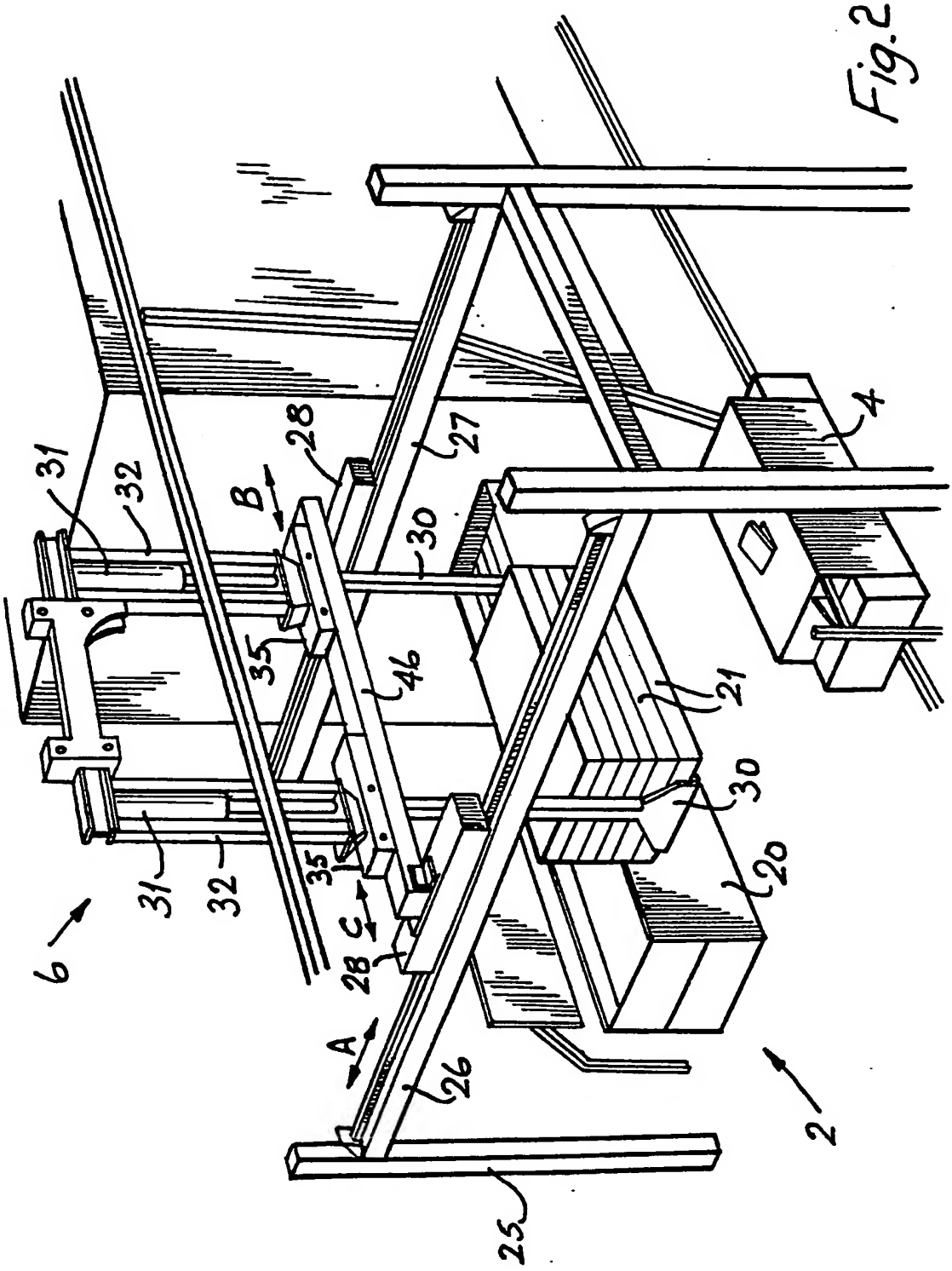

Fig.2

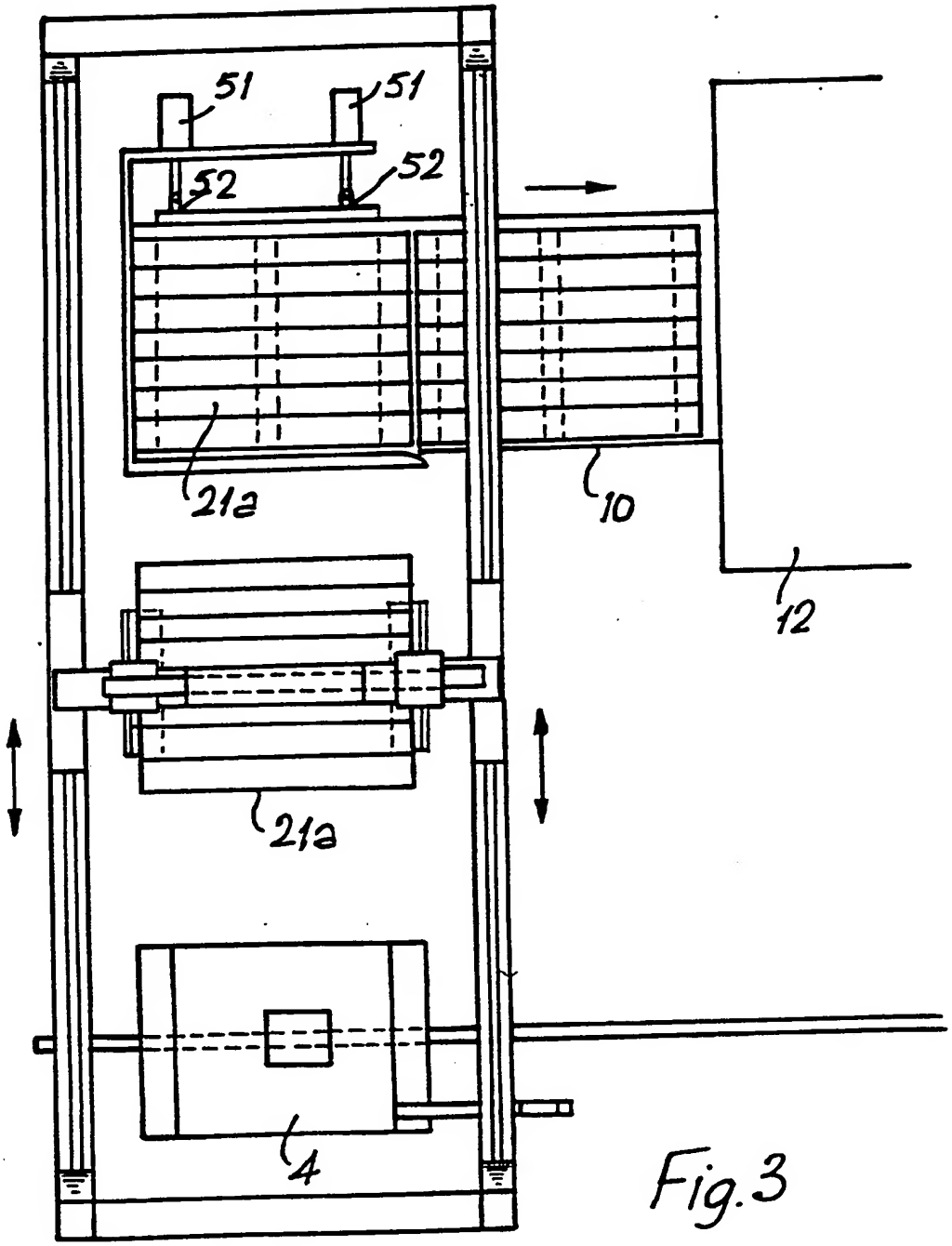

Fig.3

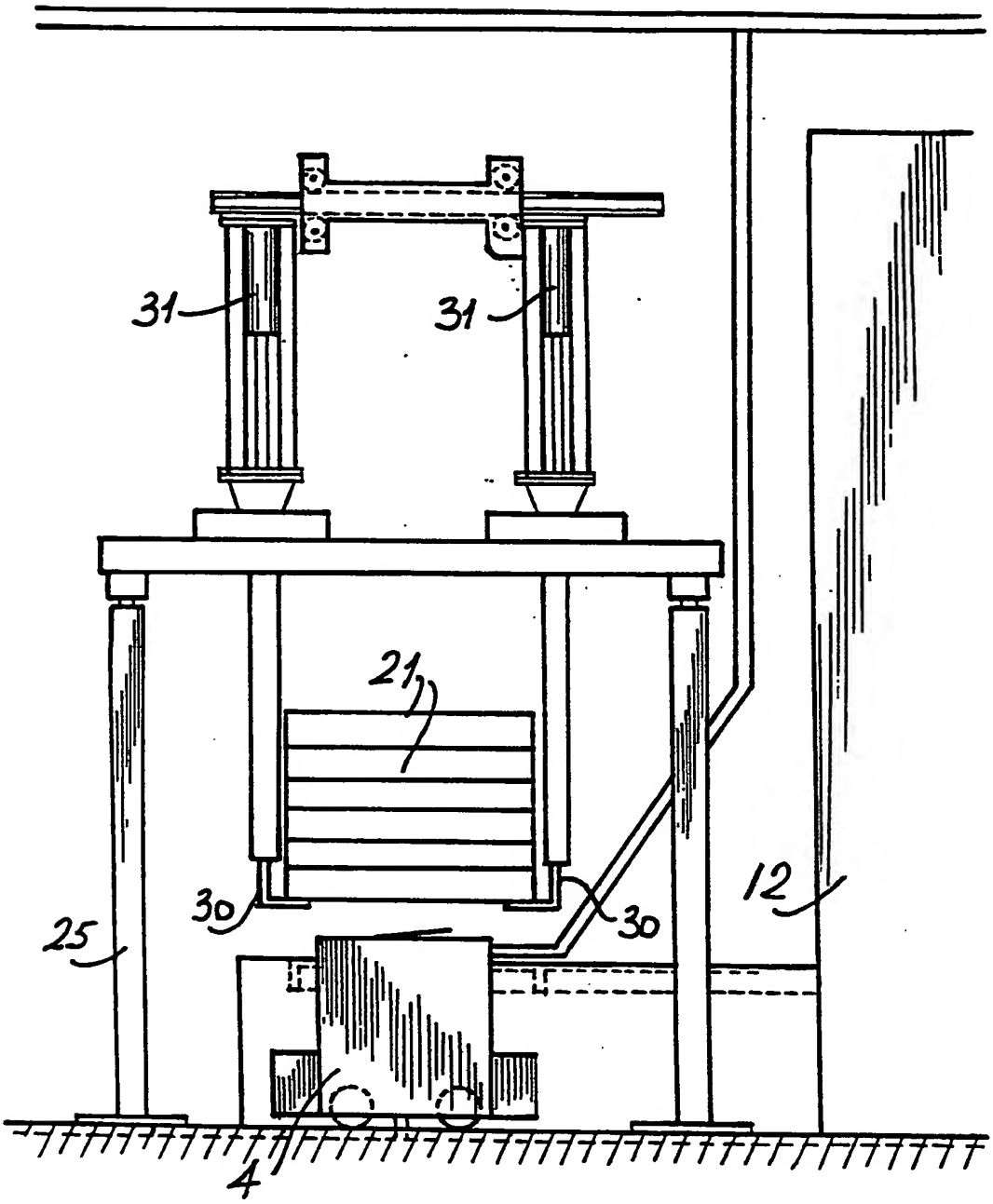

Fig.4

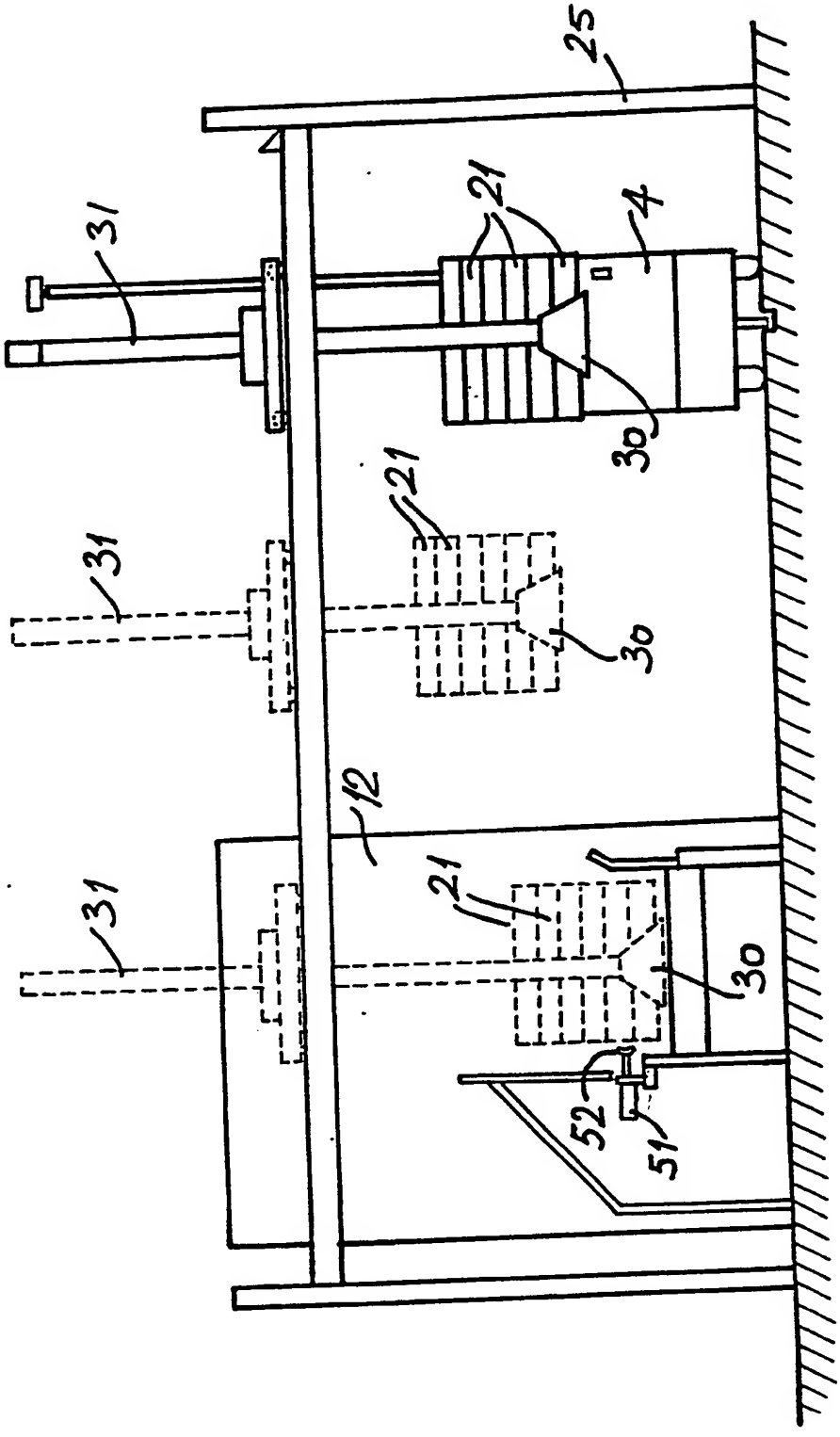

Fig. 5

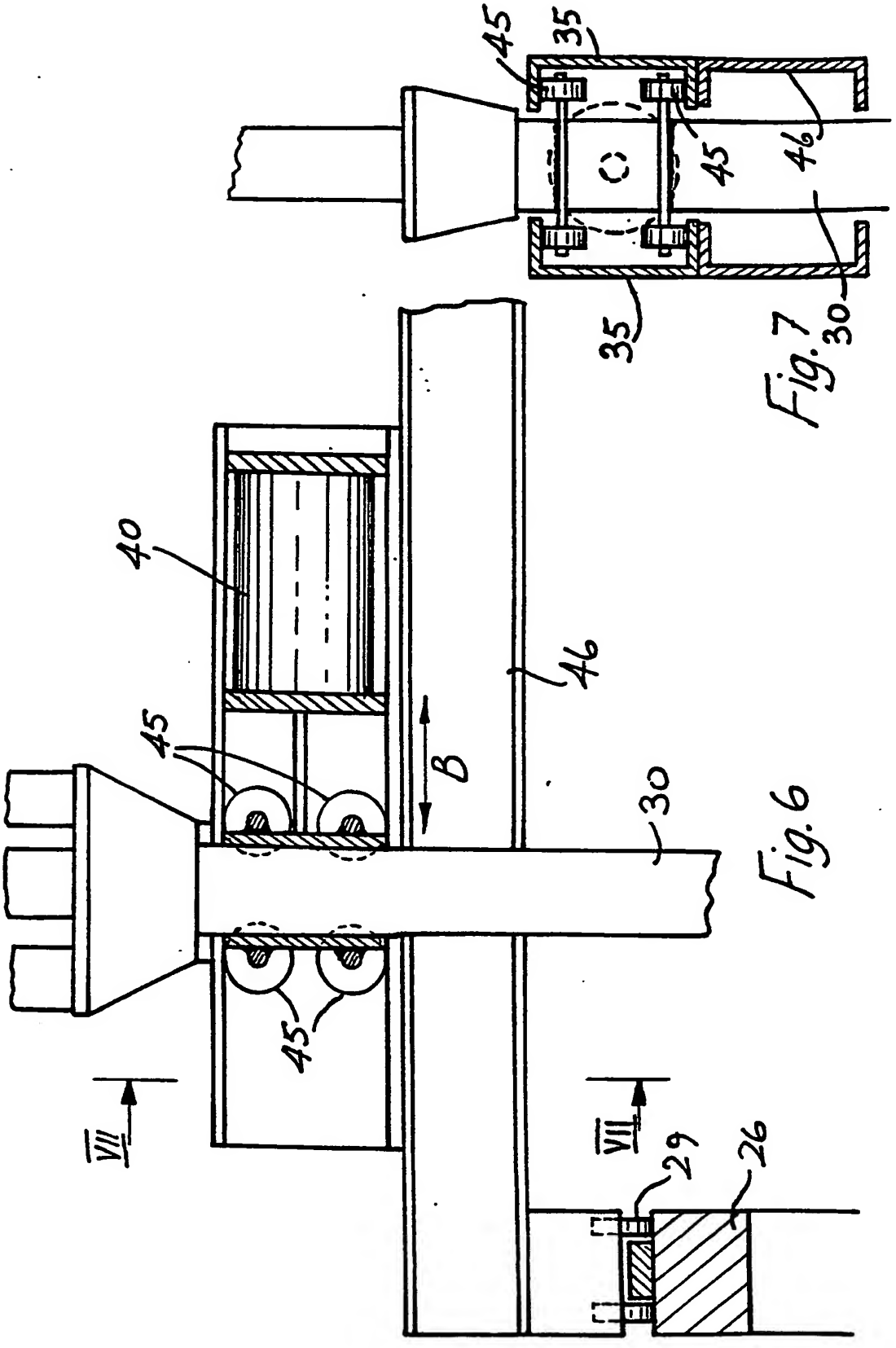

Fig. 7

Fig. 6

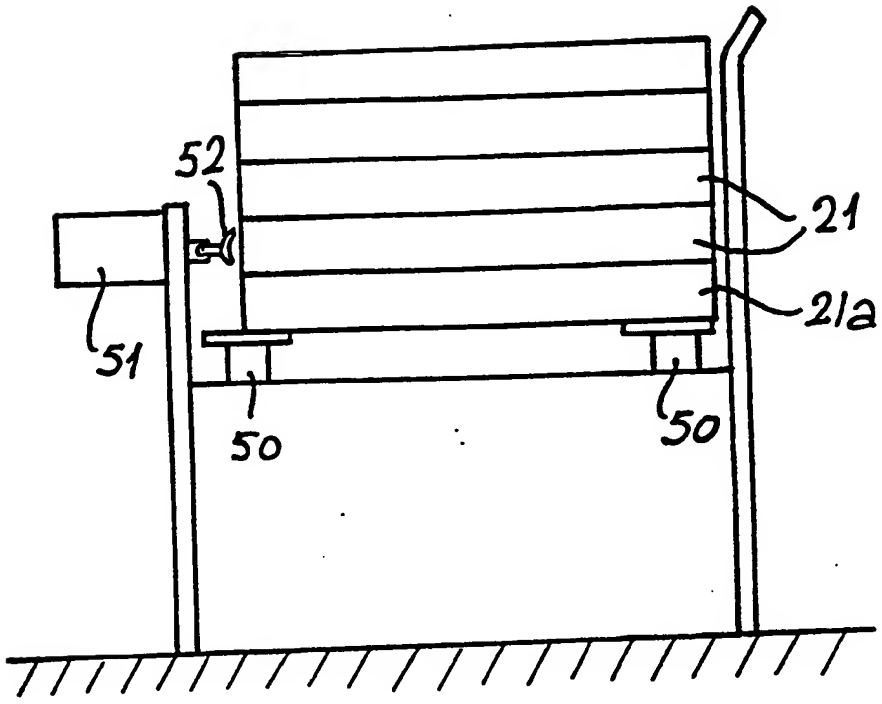

Fig. 8a

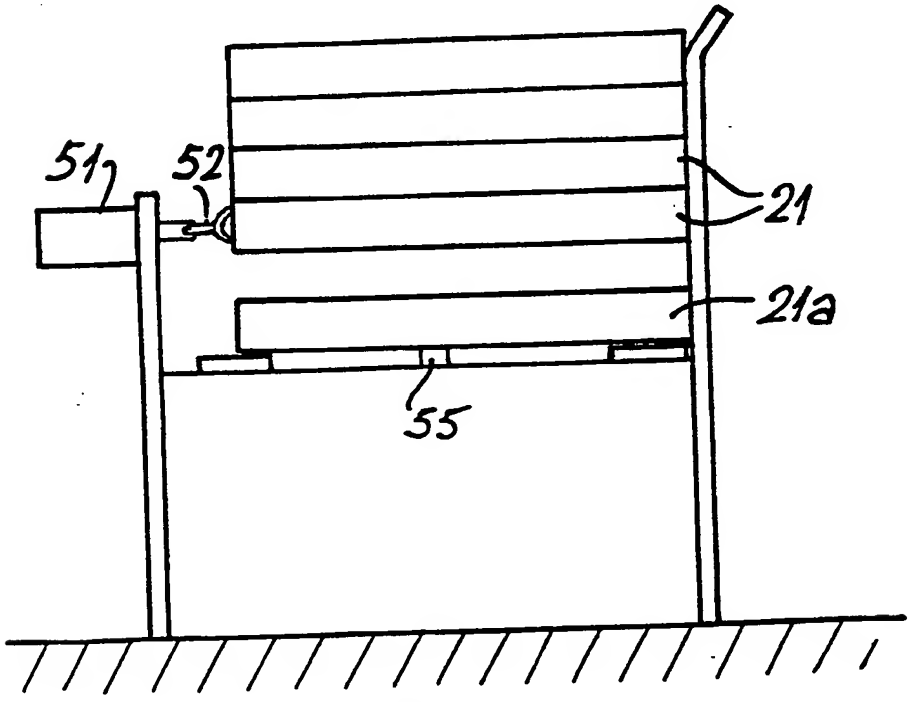

Fig. 8 b

"A Method and Apparatus for Processing Granular Material"

The invention relates to an apparatus for processing granular material and in particular to an apparatus for packing granular fertilizer material. The invention also relates to a method of processing granular fertilizer material utilising the apparatus of the invention.

According to the invention there is provided apparatus for packing granular material comprising:

a pallet magazine for a magazine of empty pallets;

a palletiser for palletising bags of granular material;

a pallet waiting station between the pallet magazine and the palletiser;

pallet transfer means for transferring a pallet from the pallet magazine to the waiting station; and

conveyor means for transferring a pallet from the waiting station to the palletiser,

the pallet transfer means for transferring a pallet from the pallet magazine to the waiting station comprising:

lifting means for raising the magazine of empty pallets;

clamp means for clamping the pallets above the lowermost pallet in a raised position;

release means for releasing the lowermost pallet from the magazine of empty pallets; and

means for translating the lowermost pallet to the waiting station.

In a particularly preferred embodiment of the invention the clamp means engages the empty pallet above the lowermost pallet in the pallet magazine.

Preferably the clamp means comprises a ram means which is extended to clamp the pallet above the lowermost pallet in the raised position.

In a particularly preferred embodiment of the invention the means for translating the lowermost pallet to the waiting station comprises a conveyor onto which the lowermost pallet is dropped on release of the lifting means when the clamp means is engaged.

In one embodiment of the invention the lifting means comprises a pair of spaced-apart risers which are extended by a ram means to lift the magazine of empty pallets above the conveyor means.

In a particulary preferred embodiment of the invention the apparatus includes empty pallet transporting means for leading a bank of empty pallets to the pallet magazine and pallet magazine transfer means for transferring the bank of empty pallets to the pallet magazine.

In this embodiment of the invention preferably the pallet magazine transfer means comprises a grab mechanism which is movable from a pick-up position for pick-up of the bank of empty pallets from the transporting means to a discharge position for delivering the bank of empty pallets onto the pallet magazine.

In a particulary preferred arrangement the grab mechanism comprises ram operated clamp means which travels along guides

in a support framework between the pick-up and discharge positions.

In a preferred arrangement the empty pallet transporting means comprises a robotic trolley which travels along a track from an empty pallet loading station to a transfer station adjacent to the pallet magazine.

In a particulary preferred embodiment of the invention the apparatus includes control means for automatic operation of the pallet magazine transfer means in response to the arrival of the robotic trolley at the transfer station to transfer a bank of pallets from the robotic trolley to the pallet magazine.

The invention also provides a method for processing granular material fertilizer utilising the apparatus of the invention, the method comprising the steps of:

coating the granular material with an anti-caking agent,

packing the coated granular material into bags,

loading a pallet magazine with empty pallets,

feeding a pallet from the magazine to a waiting station,

feeding a first pallet from the waiting station into a palletiser,

feeding another pallet from the magazine to the waiting station,

loading the bags of fertilizer material onto the first pallet,

discharging a full pallet from the palletiser,

leading the second pallet from the waiting station into the palletiser, and

shrink wrapping the bags and first pallet.

In a particularly preferred embodiment of this aspect of the invention a pallet is fed from a magazine to the waiting station by a process comprising the steps of:

raising the magazine of empty pallets,

clamping the pallets above the lowermost pallet in a raised position,

releasing the lowermost pallet from the magazine, and

translating the lowermost pallet to the waiting station.

The invention will be more clearly understood from the following description thereof given by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a schematic diagram of the method for processing granular material fertilizer according to the invention;

Fig. 2 is a perspective view of part of an apparatus for packaging granular material according to the invention;

Fig. 3 is a plan view of the apparatus of Fig. 2;

Fig. 4 is a side view of the apparatus of Fig. 2;

Fig. 5 is a diagrammatic view of the apparatus in operation;

Fig. 6 is a side, partially cross sectional view of part of the apparatus,

Fig. 7 is a cross sectional view on the line VII-VII in Fig. 6, and

Figs. 8a and 8b are diagrammatic views illustrating the operation of part of the apparatus.

Referring to the drawings and initially to Fig. 1 thereof there is illustrated an apparatus for packaging granular material according to the invention indicated generally by the reference numeral 1. Only portion of the apparatus is illustrated in Fig. 1 and comprises a pallet magazine 2 for a magazine of empty pallets, in this case from a bank of empty pallets 3 by an empty pallet transporting means in the form of a robotic trolley 4 which transports empty pallets from the pallet bank 3 to a transfer station 5 adjacent the pallet magazine 2. The pallets are transferred from the transfer station 5 to the magazine 2 by a grab mechanism 6 which is diagrammatically illustrated in Fig. 1 and which will be described in more detail below. A pallet from the pallet magazine 2 is fed by a pallet transfer means according to the invention to a waiting station 10 and from there to a palletiser 12 to which bags 15 of granular fertilizer material are delivered for loading onto the pallet. A pallet loaded with bags of granular fertilizer material is then lead from the palletiser 12 to a shrink wrapping station 19 where the pallet and bags are shrink wrapped for storage.

In more detail and referring particulary to Figs. 2 to 8 the pallet magazine 2 comprises a framework 20 into which a bank, in this case six empty pallets 21 are loaded by the grab mechanism 6. A support framework 25 includes side rails 26,27 defining tracks engagable by rollers 29 (see Fig. 6) for movement of the grab mechanism in the direction of the arrows A as illustrated in Fig. 2 for transfer of a bank of pallets 21 from the robot trolley 4 at the transfer station 5 to the pallet magazine 2. The rollers 29 are housed in bearing housings 28. The grab mechanism 6 includes a pair of downwardly extending grab arms 30 which are raised and lowered by associated rams 31 which are supported in ram housings 32 mounted on grab housings 35 in which rollers 45 are mounted as illustrated in Fig. 6 for movement of the grab arms 31 in the direction of the arrow B in Figs. 2 and 6 by a transfer ram 40 from the closed or clamped position illustrated in full lines in Fig. 4 to the release position illustrated by dotted lines in Fig. 4. The release position is exaggerated for illustrative purposes. The lower housings 35 are mounted on a cross beam 46 extending between the side rails 26,27.

In operation, when the robot trolley 4 moves to the transfer station illustrated in Fig. 2 adjacent the pallet magazine 20 it activates a switch which in turn causes the grab arms 30 to move sidewardly to the trolley 4. When the grab arms 30 are above the trolley 4 the arms 30 are extended by the rams 31 to

engage the bank of pallets 21 and transfer them to the pallet magazine 20. When the pallets are loaded into the magazine 20 the grab arms 30 are released and the rams 31 are retracted to raise the grab arm 30.

To transfer a pallet from the pallet magazine 20 to the waiting station 10 risers 50 are extended to raise the bank of pallets 21 into the position illustrated in Fig. 8a. To release the lowermost pallet from the bank of pallets a clamping ram 51 having a clamp arm 52 is extended to engage the pallet above the lowermost pallet 21 and clamp it into a fixed raised position as illustrated in Fig. 8a. The risers 50 are then retracted allowing the lowermost pallet 21 to fall onto a conveyor 55 which delivers the lowermost pallet 21 to the waiting station 10 for transfer to the palletiser 12. When the lowermost pallet 21a has been delivered to the waiting station 10 the risers 50 are again extended to engage the lowermost pallet in the bank of pallets remaining in the magazine. The clamping ram 51 is then released allowing the bank of pallets 21 to fall back into the pallet magazine 2. When the pallet 21a is delivered from the waiting station 10 to the palletiser 12 the process is repeated to deliver the lowermost pallet remaining in the magazine to the waiting station.

By providing a waiting station 10 between the pallet magazine 2 and palletiser 12 considerable processing advantages are

attained. We have found that for optimum processing efficiency it is vital that the pallet is available to be fed to the palletiser on demand. Heretofore difficulties were also encountered with the pallet magazine in that, because of the generally imprecise tolerance on the pallets 21 they could easily become jammed in the pallet magazine and the processing of fertilizer granules would have to be stopped while the pallet magazine was being cleared. By providing a waiting station the processing does not have to be shut down while any difficulties with the pallet magazine are resolved as an empty pallet can be manually loaded onto a waiting station to ensure that processing can continue at all times.

The robotic trolley 4 also speeds up processing as it ensures that a supply of pallets is always available for the pallet magazine or if necessary for manual loading onto the waiting station 10.

These and other features and advantages of the invention will be readily apparent and accordingly the invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.

CLAIMS

1. Apparatus for packing granular material comprising:

a pallet magazine for a magazine of empty pallets;

a palletiser for palletising bags of granular material;

a pallet waiting station between the pallet magazine and the palletiser;

pallet transfer means for transferring a pallet from the pallet magazine to the waiting station; and

conveyor means for transferring a pallet from the waiting station to the palletiser,

the pallet transfer means for transferring a pallet from the pallet magazine to the waiting station comprising:

lifting means for raising the magazine of empty pallets;

clamp means for clamping the pallets above the lowermost pallet in a raised position;

release means for releasing the lowermost pallet from the magazine of empty pallets; and

means for translating the lowermost pallet to the waiting station.

2. Apparatus as claimed in claim 1 wherein the clamp means engages the empty pallet above the lowermost pallet in the pallet magazine.

3. Apparatus as claimed in claim 2 wherein the clamp means comprises a ram means which is extended to clamp the pallet above the lowermost pallet in the raised position.

4. Apparatus as claimed in any of claims 1 to 3 wherein the means for translating the lowermost pallet to the waiting station comprises a conveyor onto which the lowermost pallet is dropped on release of the lifting means when the clamp means is engaged.

5. Apparatus as claimed in any of claims 1 to 4 wherein the lifting means comprises a pair of spaced-apart risers which are extended by a ram means to lift the magazine of empty pallets above the conveyor means.

6. Apparatus as claimed in any preceding claim including empty pallet transporting means for leading a bank of empty pallets to the pallet magazine and pallet magazine transfer means for transferring the bank of empty pallets to the pallet magazine.

7. Apparatus as claimed in claim 6 wherein the pallet magazine transfer means comprises a grab mechanism which is movable from a pick-up position for pick-up of the bank of empty pallets from the transporting means to a discharge position for delivering the bank of empty pallets onto the pallet magazine.

8. Apparatus as claimed in claim 7 wherein the grab mechanism comprises ram operated clamp means which travels along guides in a support framework between the pick-up and discharge positions.

9. Apparatus as claimed in any of claims 6 to 8 wherein the empty pallet transporting means comprises a robotic trolley which travels along a track from an empty pallet loading station to a transfer station adjacent to the pallet magazine.

10. Apparatus as claimed in claim 9 including control means for automatic operation of the pallet magazine transfer means in response to the arrival of the robotic trolley

at the transfer station to transfer a bank of pallets from the robotic trolley to the pallet magazine.

11. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

12. A method of processing granular fertilizer material using the apparatus as claimed in any preceding claim, the method comprising the steps of:

coating the granular material with an anti-caking agent,

packing the coated granular material into bags,

loading a pallet magazine with empty pallets,

feeding a pallet from the magazine to a waiting station,

feeding a first pallet from the waiting station into a palletiser,

feeding another pallet from the magazine to the waiting station,

loading the bags of fertilizer material onto the first pallet,

discharging a full pallet from the palletiser,

leading the second pallet from the waiting station into the palletiser, and

shrink wrapping the bags and first pallet.

13. A method as claimed in claim 12 wherein a pallet is fed from a magazine to the waiting station by a process comprising the steps of:

raising the magazine of empty pallets,

clamping the pallets above the lowermost pallet in a raised position,

releasing the lowermost pallet from the magazine, and

translating the lowermost pallet to the waiting station.

14. A method of processing granular fertiliser material substantially as hereinbefore described with reference to the accompanying drawings.

15. Granular fertilizer material whenever processed by a method as claimed in any of claims 12 to 14.

AMENDMENTS TO THE CLAIMS HAVE BEEN FILED AS FOLLOWS

CLAIMS

1. Apparatus for packing granular material comprising:

a pallet magazine for receiving a magazine or bank of empty pallets;

a palletiser for palletising bags of granular material;

a pallet waiting station between the pallet magazine and the palletiser; and

single pallet transfer means for transferring a single pallet from the pallet magazine to the waiting station;

the single pallet transfer means comprising:

lifting means for raising the magazine of empty pallets;

clamp means for clamping the pallets above the lowermost pallet in a raised position;

release means for releasing the lowermost pallet from the magazine of empty pallets; and

conveyor means for translating the lowermost pallet to the waiting station and for transferring the single pallet to the palletiser, the lowermost pallet being dropped onto the conveyor means on release of the lifting means when the clamp means is engaged.

2. Apparatus as claimed in claim 1 wherein the clamp means of the single pallet transfer means engages the empty pallet above the lowermost pallet in the pallet magazine.

3. Apparatus as claimed in claim 2 wherein the clamp means comprises a ram means which is extended to clamp the pallet above the lowermost pallet in the raised position.

4. Apparatus as claimed in any of claims 1 to 3 wherein the lifting means comprises a pair of spaced-apart risers which are extended by a ram means to lift the magazine of empty pallets above the conveyor means.

5. Apparatus as claimed in any preceding claim wherein the apparatus includes pallet magazine transfer means for delivery of a bank of empty pallets into the pallet magazine.

6. Apparatus as claimed in claim 5 wherein the pallet magazine transfer means comprises a grab mechanism which is movable from a pick-up position for pick-up of a bank of empty pallets to a discharge position for delivering the bank of empty pallets into the pallet magazine.

7. Apparatus as claimed in claim 6 wherein the grab mechanism comprises ram operated clamp means which travels along guides in a support framework between the pick-up and discharge positions.

8. Apparatus as claimed in any of claims 5 to 7 wherein the apparatus includes empty pallet transporting means for leading a bank of empty pallets to the pallet magazine transfer means.

9. Apparatus as claimed in claim 8 wherein the empty pallet transporting means comprises a robotic trolley which travels along a track from an empty pallet loading station to a transfer station adjacent to the pallet magazine transfer means.

10. Apparatus as claimed in claim 9 including control means for automatic operation of the pallet magazine transfer means in response to the arrival of the robotic trolley at the transfer station to transfer a bank of pallets from the robotic trolley to the pallet magazine.

11. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

12. A method of processing granular fertilizer material using the apparatus as claimed in any preceding claim, the method comprising the steps of:

coating the granular material with an anti-caking agent,

packing the coated granular material into bags,

loading a pallet magazine with empty pallets,

feeding a single pallet from the magazine to a waiting station,

feeding the first pallet from the waiting station into a palletiser,

feeding another pallet from the magazine to the waiting station,

loading the bags of fertilizer material onto the first pallet,

discharging a full pallet from the palletiser,

leading the second pallet from the waiting station into the palletiser, and

shrink wrapping the bags and first pallet.

13. A method as claimed in claim 12 wherein a single pallet is fed from a magazine to the waiting station by a process comprising the steps of:

raising the magazine of empty pallets,

clamping the pallets above the lowermost pallet in a raised position,

releasing the lowermost pallet from the magazine, and

translating the lowermost pallet to the waiting station.

14. A method of processing granular fertiliser material substantially as hereinbefore described with reference to the accompanying drawings.

15. Granular fertilizer material whenever processed by a method as claimed in any of claims 12 to 14.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9022733.1

Relevant Technical fields

(i) UK Cl (Edition K) B8C CSA1,CSA2,CSP1,CSP2,CSF2, CU13

(ii) Int Cl (Edition 5) B65G

Search Examiner
J A WALLIS

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search
3 DECEMBER 1990

Documents considered relevant following a search in respect of claims 1 AT LEAST

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2042458 A (STEEMAN) NB lines 7-15, page 2	1 at least
X,Y	GB 894330 (MATHEWS ETC) eg line 60, page 6 - line 103, page 7	1-5 at least
Y	GB 827324 (DRAMARD) eg lines 53-127, page 2	1 at least
X,Y	US 4764074 (POSTIGO) eg lines 34, column 5, lines 49, column 6	1-6 at least
Y	US 4701092 (REYNAUD) NB lift and clamping means 86, 100 etc	1-5 at least
Y	US 4271755 (KINTGEN ETC) eg lines 49-59, column 4	1 at least
Y	US 4073387 (BOWSER) eg lines 56-64, column 5	1 at least

sf - c:\wp51\doc99\fil001545

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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